REMARKS

Claim Amendments

Applicant's claims 59-78 remain unchanged. Claims 79-85 have been amended. New claims 86-88 have been added. No new matter has been added to the application.

New claims 86-88 are directed to a filter unit having trisoid-shaped openings. This feature is supported in the specification and drawings of the application as originally filed (See, e.g., FIG. 14 and published application, paragraph [0059]). Referring to the Office Action dated May 23, 2002, page 4 (See Exhibit A), Applicant agrees with the Examiner's reading of the "Beyond the Ellipse" (See Exhibit B) definition for a trisoid to mean a curve that results when the total distance from three points is kept constant. Applicant hereby withdraws any definition of trisoid meaning a triangle with radially rounded edges, so that there are not pointed edges in the openings, to the extent that this second definition is inconsistent with the definition from "Beyond the Ellipse" provided in the previous sentence.

35 U.S.C. 112 Rejection

Claims 82-85 are rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. More specifically, the Examiner considers the language in these claims relating to the outer periphery of the filter unit having sharp edges to be new matter. The Examiner indicates that there is "no discussion of the issue of edge sharpness" in the originally filed disclosure.

Applicant respectfully disagrees with the Examiner's rejection. Applicant submits that §112 does not require that the disclosure include a "discussion" of the claimed subject matter, as suggested by the Examiner. For example, under proper circumstances, the drawings alone may provide a written description of an invention under §112. *See, e.g., Cooper Cameron v. Kvaerner Oilfield*, 291 F. 3d 1317 (Fed. Cir. 2002). Drawings constitute an adequate description if they describe what is claimed and convey to those of skill in the art that the patentee actually invented what is claimed. *Id.* As noted in Applicant's previous response to Office Action dated October 23, 2002, pages 5-9 (See Exhibit C), this is particularly true with regard to mechanical cases that rely heavily on drawings.

To further clarify the particular feature that Applicant is claiming, Applicant has amended the subject claims to specify that the outer periphery of the filter unit has sharp "corners."

FIGS. 5, 6, 7, 8, 9, 10, 11 and 13 of the drawings in Applicant's originally filed disclosure all show embodiments of the filter unit having three or more sides. The sides of each unit connect such that sharp "corners" are formed on the outer periphery of the unit. In connection therewith, paragraph [0012] of Applicant's published application teaches that the units may have "substantially any polygonal configuration, such as triangles, quadrilaterals and pentagons."

Thus, to put it another way, the triangular, quadrilateral, pentagonal, and other similarly shaped figures shown in the aforementioned drawings all, by definition, have three or more sharp "corners" formed on their outer peripheries. This feature is prominently displayed in the drawings, and would be understood by one skilled in the art based solely upon viewing the drawings. The sharp "corners" on the units in the drawings are particularly distinguishable when compared with the units shown in FIGS. 4 and 12 on the same page, which have curved exterior peripheries and no sharp corners.

Applicant respectfully submits that the features in claims 82 - 85 are, at the least, described in the drawings, and are not new matter. Further, Applicant submits that claims 82 - 85 are patentably distinct from the cited references. For example, the Fulton reference cited in the §103(a) rejection expressly states as follows:

> ...many of the shapes [in FIG. 1 of Fulton] can be eliminated because they would not have the structural strength to resist crushing and abrasion, or would not be easy to fabricate. For example, several in FIG. 1 have sharp corners, which would soon crumble in service.

Thus, Fulton expressly teaches away from using units with sharp corners. In direct contrast, Applicant's claimed units advantageously utilize these particular shapes without suffering the disadvantages of the prior art. As such, Applicant's units are patentably distinct.

35 U.S.C. §103(a) Rejection – Kramer in view of Fulton, and further in view of Hung:

Claims 59, 61 – 67, and 69 – 85 were rejected under the provisions of 35 U.S.C. § 103(a), as allegedly being unpatentable over Kramer, US 4,615,796 (hereinafter "Kramer"), in view of "CE Refresher: Catalyst Engineering, Part 2" by John Fulton (hereinafter "Fulton"), and further in view of Hung et al., DE 3,539,195 (hereinafter "Hung").

In response to this rejection, Applicant has amended dependent claims 79-81 to specify that the elliptical openings are non-circular, that is, the eccentricity of the elliptical openings is greater than zero. In this regard, it is understood in the relevant art that a circle has an eccentricity equal to zero.

Applicant also hereby resubmits the arguments which were previously presented in Applicant's office action responses dated November 5, 2003, and February 17, 2005, and in Applicant's appeal brief originally filed March 13, 2006, including all subsequent amendments.

Further, Applicant hereby submits the enclosed second set of test results performed by inventor John N. Glover (See Exhibit D, which includes both Applicant's first set of test results (Table 1) which was previously submitted as well as Applicant's new second set of test results (Table 2)). These new experiments show that the units of the present invention having trisoid-shaped openings (see Table 2, column D) displayed unexpected and surprisingly advantageous fluid distribution properties when compared to triangular openings (see Table 2, columns A & B).

Applicant further submits that the initial experimental results (Table 1) show that units of the present invention having non-circular elliptical openings display unexpected and surprisingly advantageous fluid distribution properties compared to units with circular openings substantially similar to those shown in Fulton. New rows 10 and 11 have been added to the initial test results for certain sized units to show additional advantageous properties discovered by Applicant. In this regard, Applicant submits that the advantages provided by non-circular elliptical openings as compared to circular openings are not recognized by the Hung reference cited by the Examiner and would not be readily recognizable to one skilled in the art. Regardless of what Hung may teach, Applicant's test results show that non-circular elliptical openings simply perform better

than circular openings. Applicant's commercial success in selling units having non-circular elliptical openings further reinforces this assertion.

CONCLUSION

In view of the foregoing information, Applicant submits that Claims 59, 61 – 67, and 69 – 88 are novel, not obvious and patentable in view of the cited prior art.

In commenting upon the references and in order to facilitate a better understanding of the differences that are expressed in the claims, certain details of distinction between the references and the present invention have been mentioned, even though such differences do not appear in all of the claims. It is not intended by mentioning any such unclaimed distinctions to create any implied limitations in the claims. Not all of the distinctions between the prior art and Applicant's present invention have been made by Applicant. For the foregoing reasons, Applicant reserves the right to submit additional evidence showing the distinctions between Applicant's invention to be novel and nonobvious in view of the prior art.

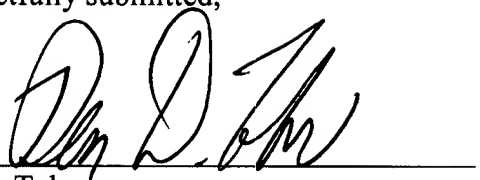
The foregoing remarks are intended to assist the Examiner in examining the application and in the course of explanation may employ shortened or more specific or variant descriptions of some of the claim language. Such descriptions are not intended to limit the scope of the claims; the actual claim language should be considered in each case. Furthermore, the remarks are not to be considered to be exhaustive of the facets of the invention that render it patentable, being only examples of certain advantageous features and differences which Applicant's attorney chooses to mention at this time.

In view of the foregoing Amendment, Applicant respectfully submits that the presently presented claims are allowable, and Applicant respectfully requests the issuance of a Notice of Allowance.

The Commissioner is hereby authorized to charge all fees and any additional fees that may be required or credit any overpayment to Deposit Account No. 50-0259 (Order No. 020781.04).

Date: June 8, 2007

Respectfully submitted,



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sectional configurations of about 1/4 to 3 inch diameter" provides support; however, 0.5 is not 1/4.

7. Concerning claim 54, it is considered that there is no support for the limitation "square cross-sectional configuration with a width of 0.5 inches to 3 inches" in the original specification. Applicant argues that the statement in the specification "square cross-sectional configurations of about 1/4 to 3 inches" provides support; however, 0.5 is not 1/4.

8. Likewise the ranges of claims 55, 56, 57 and 58 are not supported by the original disclosure.

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> **The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.**

10. Claims 46-49 and 51-58 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear what is intended by the term "trisoid". In the most recent communications, Paper Nos. 17 and 20, applicant apparently withdraws the previous definition of "trisoid", which applicant set advanced in Paper No. 15, an now states "Applicant agrees with the Examiner's reading of the 'Beyond the Ellipse' definition for a trisoid being a curve that results when the total distance from three points it kept constant". However, applicant then sets forth yet another definition stating "The desired shape, for the openings that are called 'trisoids' in the specification, is a triangle with radially rounded edges, so that there are not pointed edges in the openings". This contradicts the 'Beyond the Ellipse' definition, for

example, because any "triangle" portion would include a line segment (see Fig. 3 of US Pat. No. 5,895,572 for illustration).

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

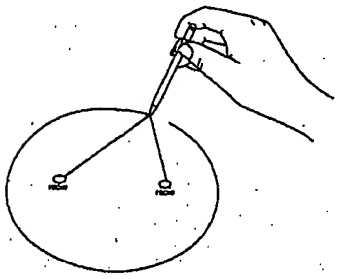
12. Claims 46-48 and 51-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hung et al. (DE 35 39 195). Note: all page and line numbers refer to the English language translation of DE 35 39 195. Regarding claim 46, Hung ('195) discloses a method of fluid distribution in a chemical reactor comprising the steps of providing a layer of ceramic filter units, at least some of the ceramic filter units having a plurality of elliptical openings (see fig. 3; page 10, lines 5-8); contacting an organic – based feed stream with the layer (see page 7, lines 8-22); and the stream is subdivided as a result of entering the openings (see page 11, lines 19-20) prior to the organic-based feed contacting a catalyst bed in the chemical reactor (see page 21, lines 5-7 and the English language Derwent abstract). While the number of opening is not discloses to be "more than two", applicant expressly admits on page 23, lines 10-12 of the specification that "it will be apparent to one of ordinary skill in the art that a greater, or smaller, number of openings 88 may be provided". See also *St. Regis Paper Co. v. Bemis Co., Inc.* 193 USPQ 8,11 (7th Cir. 1977) and *In re Harza* 124 USPQ 378 (CCPA 1960) regarding the obviousness of duplicating parts. Regarding claim 47, removing

Ivars Peterson's **MathTrek**

September 2, 1996

Beyond the Ellipse

There's a simple trick one can use to draw an ellipse. Tie the ends of a length of string to two pins (or thumbtacks) stuck in a sheet of paper on a drawing board. Then, keeping the string taut with the point of a pencil, allow the pencil to trace a path around the pins. The resulting curve is an ellipse, with the two pins, or fixed points, representing its foci.



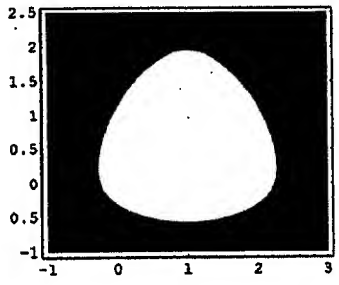
Drawing an ellipse.

This drawing method takes advantage of the geometric fact that the sum of the distances from the foci of an ellipse is the same for all points on the curve. Thus, If A and B are the foci of an ellipse, the total distance (AP + PB) from the foci to any point P on the curve is constant.

One can also ask what curve results when the total distance from *three* given points is kept the same. For example, suppose that the pins are placed at the corners of an equilateral triangle. In this case, it's not possible to draw the figure using a pencil and string because the pins would end up getting in the way of the string. However, one can explore this possibility using a computer.

That's precisely what Bilge Demirkoz, a 16-year-old high school student in Istanbul,Turkey, did to investigate what happens for not only three but also four fixed points. She presented a guided tour of her findings in this neglected corner of mathematics one evening at the Seattle Mathcamp (see last week's MathLand article, Math Camp).

In the case of three points, her computer plots showed an oval figure that was obviously neither a circle (one fixed point) nor an ellipse (two fixed points). She called the result a trisoid. Its precise form depended on the given total length and the relative positions of the three given points. Four fixed points led to another curiously rounded shape.



Example of a trisoid.

When Demirkoz looked for the geometric form that results when the sum of the distances from two points minus the distance from a third point is kept constant, she found additional surprises. In this case, depending on the chosen constant distance, the figure has an outer boundary that looks somewhat like an ellipse (though it isn't) and sometimes has an inner boundary -- a hole -- that looks like a circle (but isn't).

These computer explorations represent just the first stage in a potentially rewarding mathematical investigation. They raise a variety of questions and prompt a number of conjectures about the characteristics and behavior of these curves.

Such results may even have relevance to physical systems, Demirkoz notes. For example, elliptical orbits arise when one body orbits another under the influence of gravity. It's possible that certain gravitational or electric fields could lead to these other kinds of orbits.

In *Mathematics: Queen and Servant of Science,* Eric Temple Bell writes: "A circle no doubt has a certain appealing simplicity at first glance, but one look at an ellipse should have convinced even the most mystical of astronomers that the perfect simplicity of the circle is akin to the vacant smile of complete idiocy. Compared to what an ellipse can tell us, a circle has little to say. Possibly our own search for cosmic simplicities in the physical universe is of this circular kind -- a projection of our uncomplicated mentality on an infinitely intricate external world."

Perhaps the trisoid and its geometric cousins illuminate a small corner of the cosmic complexity.

References:

Bell, Eric Temple. 1987. *Mathematics: Queen and Servant of Science.* Washington, D.C.: Mathematical Association of America.

Gardner, M. 1995. *New Mathematical Diversions.* Washington, D.C.: Mathematical Association of America.

Trisoid diagram created by I. Peterson using Mathematica 3.0 (http://www.wolfram.com).

Comments are welcome. Please send messages to Ivars Peterson at ipeterson@maa.org.

providing a layer of a plurality of ceramic filter units, each of the ceramic filter units including a body, a central opening extending through the body, and at least three openings also extending through the body and positioned between the central opening and an outer periphery of the body so that a combination of the central opening and the at least three openings define a plurality of fluid flow passageways extending through each of the plurality of ceramic filter units;

contacting an organic-based feed stream with the layer of the plurality of ceramic filter units; and

subdividing the organic-based feed stream into a plurality of smaller fluid streams by passing the organic-based feed stream through the plurality of fluid flow passageways prior to the organic-based feed stream contacting a catalyst bed in the chemical reactor.

REMARKS

Applicant wishes to thank the Examiner for courtesies extended during the telephonic conference between Examiner and Applicant's attorneys.

Claims 46 – 58 have been cancelled and new claims 59 – 78 have been added. Reconsideration of this application is respectfully requested.

35 U.S.C. §112, First Paragraph Rejection

Claims 46 – 48 and 51 – 58 were rejected under the provisions of 35 U.S.C. § 112, first paragraph, as allegedly containing subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention. These claims have been cancelled and replaced with new claims as described herein.

As a result of the telephonic interview, the Examiner acknowledged that claims where the ceramic units have a central opening and the at least three openings positioned between the outer periphery and the central opening define over the Hung patent document. Accordingly,

Applicant agreed to and submits herewith these features being included in the proposed new claims. The Hung patent document (page and line numbers refer to the English language translation) "concerns hydroprocessing or hydrotreatment catalyzers which... comprise extrudates with a cross-section that is oval and has two holes therein." (p.2, ll. 1-4). The catalyzers have openings therein "which are circular or oval" (p. 9, ll. 6-7), with "oval" being defined as shapes with two areas of relatively great curvature separated by two areas with relatively less curvature should also be comprised therein." (p. 8, ll. 15, 16-18).

The Examiner also acknowledged Applicant's position on the *Purdue Pharma* case [*Purdue Pharma L.P. v. Faulding, Inc.*, 56 U.S.P.Q.2d 1481 (CA FC 2000)] and asked for further explanation in the written response. The Examiner indicated that if Applicant could further distinguish the present case from the *Purdue Pharma* case, Examiner would withdraw his rejections based upon § 112, first paragraph.

As an initial matter, Applicant respectfully submits that support for the amended independent claims can be found in the specification, including the drawings, and no new matter has been added. Applicant can show possession of an invention by disclosure of drawings that are sufficiently detailed to show that application was in possession of the claimed invention as a whole. MPEP § 2163. "[D]rawings alone may provide a 'written description' of an invention as required by Sec. 112," *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1565, 19 USPQ2d 1111, 1118 (Fed. Cir. 1991).

Examiner suggested that the present case is analogous to the facts of the *Purdue Pharma* case, which held that the amended claims were invalid under § 112. Upon further examination of this case, the present case is quite factually distinguishable from *Purdue Pharma*, making this case inapplicable to the present situation.

Applicant notes that the cases relied upon by Examiner are all considered to be in the unpredictable arts, while the present invention is considered to be within the predictable arts. In unpredictable arts, such as chemistry or biology, a heightened enablement disclosure is required, such as in *Purdue Pharma*. Mechanical arts are considered predictable due to permissible

reliance upon established scientific and mathematical laws. Other areas, such as biological arts, are considered unpredictable because scientists are unable to precisely predict how simple changes in temperature, pressure, and pH will affect biological processes. See *In re Fisher*, 427 F.2d 833, 839 (C.C.P.A. 1969). This is not so with the present case. Applicant's ceramic filter units are a mechanical structure toward which the Examiner expresses his concern. As such, one skilled in this technology more readily understands various species and description related to this portion of the claimed invention.

In *Purdue Pharma*, the claims were directed to methods of treating pain in patients by administering a time-released drug once a day. During prosecution of the Purdue patent, all of the originally submitted claims were cancelled and all new claims were added and subsequently allowed. The primary issue in Purdue was whether a limitation within claim 1 was adequately described in the disclosure of the patent application as originally filed. The limitation at issue in Purdue was if a ratio of a maximum plasma concentration (Cmax) / a plasma level of the drug at about 24 hours after administration of the drug (C24) was greater than 2.

In chemical and other unpredictable art cases, examples are provided many times to illustrate that a combination of variables provides a certain result. Examples are rarely used in mechanical cases. Mechanical cases rely heavily on drawings, which are required to show every claimed feature. 37 C.F.R. § 1.83. Examples are generally only required when the specification does not provide an enabling disclosure.

The portion of the opinion relied upon by the Examiner concerns the examples provided within the Purdue application. If the examples in Purdue had specifically indicated that a Cmax/C24 ratio of over two was a feature of the present invention, it is likely that the court would have found that the examples were enabling. The Purdue examples were defective in providing support for the Cmax/C24 ratio since the examples did not contain the Cmax/C24 ratio at all. Seven examples were provided in Purdue within the specification. Values for Cmax and C24 were only provided for the first three examples, but not the ratio. The Cmax/C24 ratio was not provided for any of the examples, it had to be calculated from the "multitude of pharmacokinetic parameters". Purdue only pointed to two of the examples as even having a

Cmax/C24 ratio of greater than 2.0. Several of the other examples had a Cmax/C24 ratio of less than 2.0. The court found that nothing in the specification indicated to the skilled artisan which of the examples embodied the claimed invention and which did not. See *Purdue Pharma* generally.

Our situation is clearly different. Each and every figure shown illustrates an embodiment of the present invention. There is no question as to which figures are considered within the scope of the present invention. The specification references the drawings throughout. For example, page 23 alone of the specification references each figure embodying the present invention.

> Line 1: "FIGS. 4 and 5 illustrate a specific embodiment of the present invention..."
>
> Lines 13 – 14: "With reference to FIG. 15, the top surface 105 ... may be used to contact solid particles..."
>
> Lines 15 – 16: "Irregularly shaped top and bottom surfaces 105, 107 (FIG. 16) may augment this process.
>
> Lines 18 – 20: "Other cross-sectional configurations used for the ceramic filter units may include triangles 94 (FIG. 6), quadrilaterals 96 (FIG. 7), pentagons 104 (FIG. 8), hexagons 110 (FIG. 9), heptagons 100 (FIG. 10), octagons 106 (FIG. 11), ellipses 92 (FIG. 12), and squares 90 (FIG. 13), ..."

Numerous additional references to the drawings have been made throughout the corresponding specification. In the present application, there is no need to try to determine which of the embodiments are within the scope of the present invention.

In *Purdue Pharma*, importantly, there was no mention of the ratio of Cmax/C24 at all in the specification. Purdue was arguing that support for the addition of the ratio was found in the examples. Nowhere within the specification did Purdue refer to the examples as providing the ratio Cmax/C24. Nor did Purdue indicate which of the examples actually had a ratio of Cmax/C24 greater than two. The ratio was never disclosed. Readers would have to calculate it based upon the data provided in the examples.

Here, the drawings clearly show three or more openings in each and every figure. There is no need to calculate anything or try to determine which figures embody the present invention and which do not. All of the figures are considered within the scope of the present invention. The Examiner indicated that claiming a central opening was likely required to distinguish from the Hung prior art reference. Applicant has complied with this request without prejudice to further this case.

The Examiner also relied upon *Waldemer Link GmbH & Co. v. Osteonics Corp.*, 32 F.3d 556,558 31 U.S.P.Q.2d 1855, 1857 (Fed. Cir. 1994), which based its decision upon *In re Ruschig*, 379 F.2D 990, 154 U.S.P.Q. 118 (CCPA 1967). In *Ruschig*, which is also a chemical case, the general disclosure encompassed roughly one-half of a million possible compounds. The applicant argued that the specification provided certain "guides" in the specification that would lead one skilled in the art to the compound of the disputed claim 13. "Specific claims to single compounds require reasonably specific supporting disclosure ... naming is not essential, something more than the disclosure of a class of 1000, or 100, or even 48, compounds is required." *Ruschig*, 154 U.S.P.Q. 118, 122. The court analogized the situation to marking trails by making blaze marks on the trees. "Appellants are pointing to trees. We are looking for blaze marks which single out particular trees." *Id.* In *Ruschig*, the specific compound at issue was never specifically mentioned in the specification and the Ruschig applicant even admitted this. A number of other specific compounds were specifically disclosed within the application, but not the compound at issue.

Applicant submits that each figure in its application is a blazed marked tree. Each figure is to be considered within the scope of the present invention. There is no need to try to determine which figures are covered and which are not. Each figure embodies various features of the claimed invention.

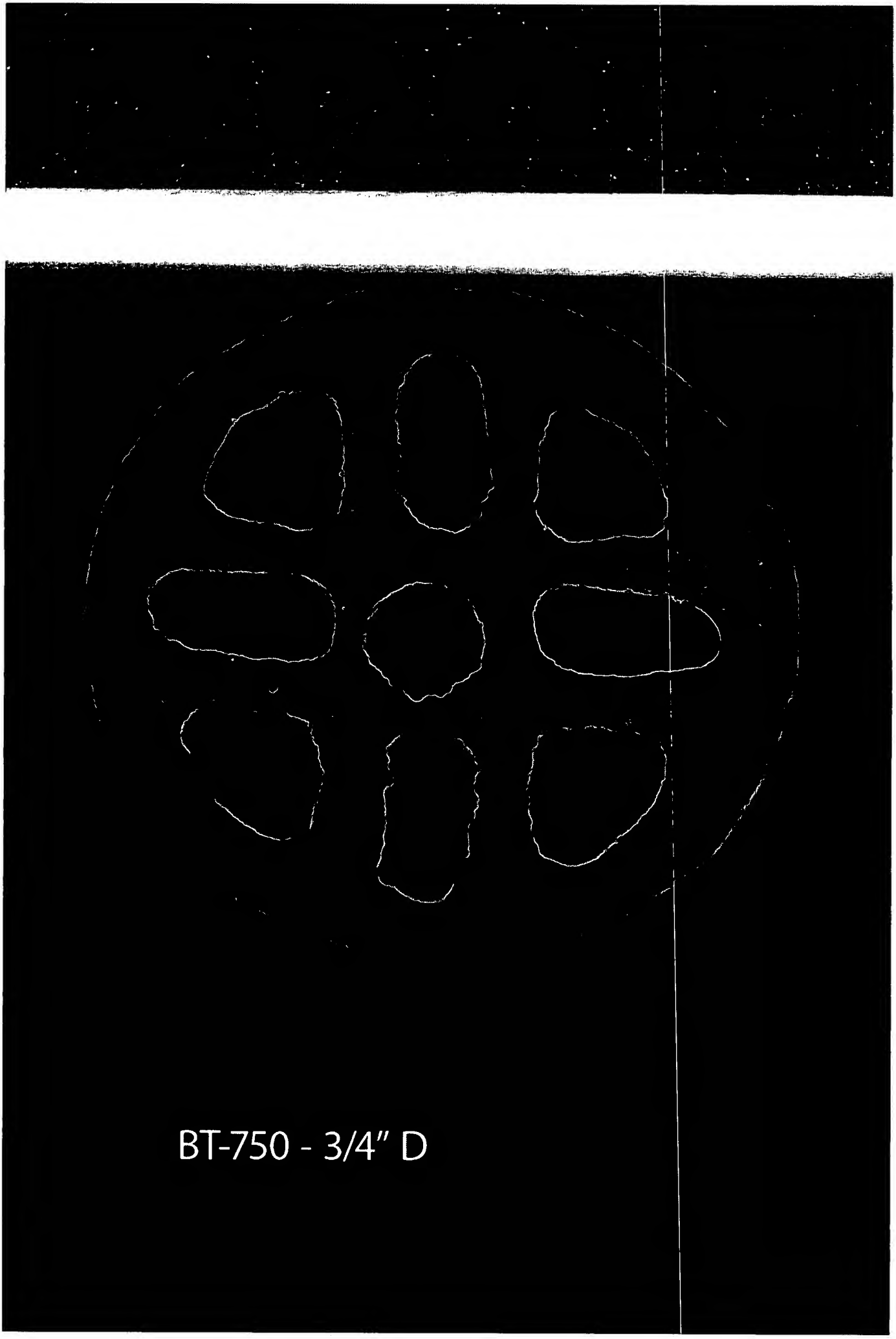
35 U.S.C. §112, Second Paragraph Rejection

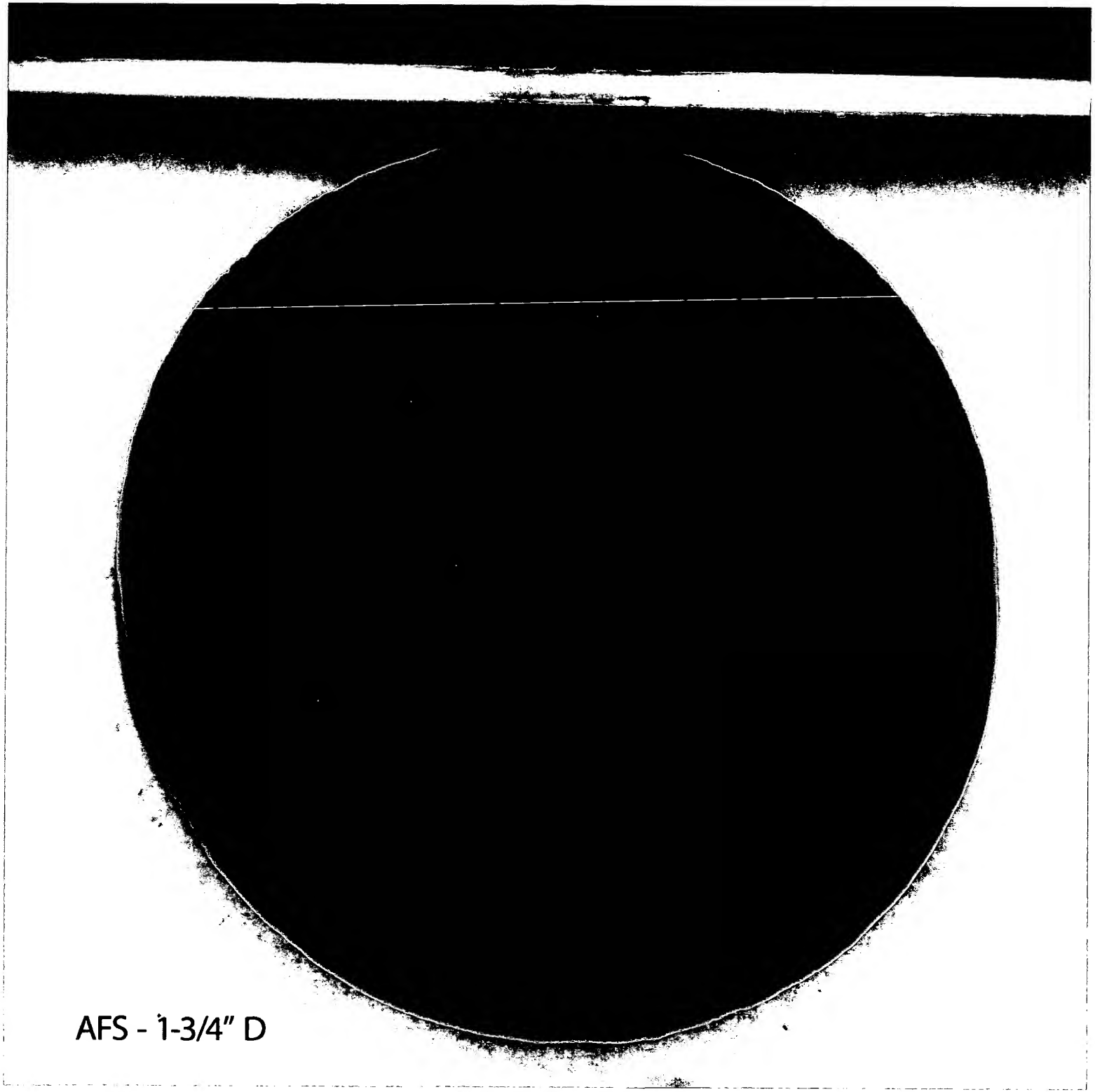
Claims 46 – 48 and 51 – 58 were rejected under the provisions of 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly

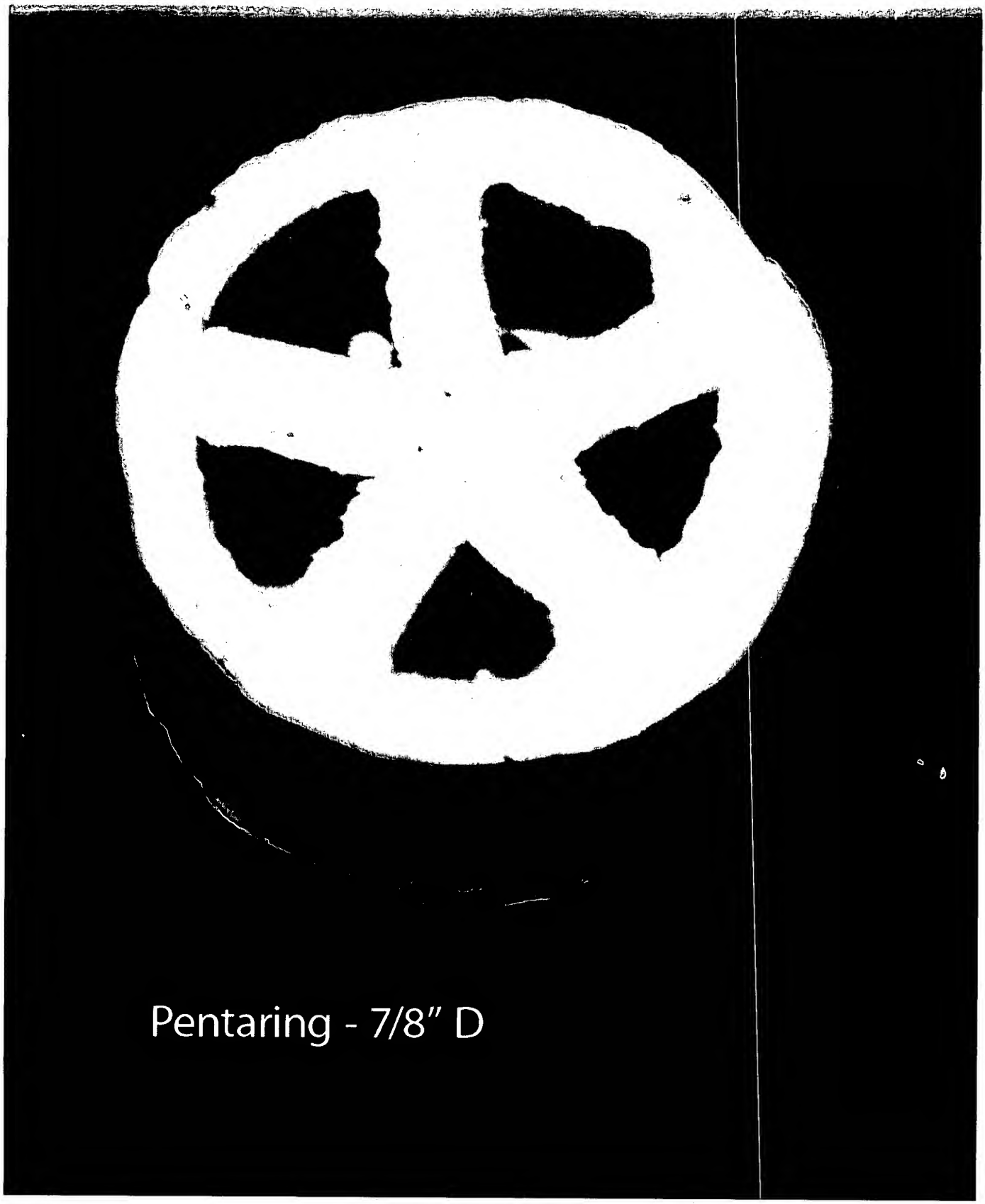
TABLE I - SUMMARY OF COLD FLOW EXPERIMENT RESULTS

Shape	PRIOR ART					PRESENT INVENTION		
	Spheres		Cylindrical Openings			Elliptical Openings		
Product	**A** (3/4" Ceramic balls)	**B** (3/4" Ceramic balls)	**C** (5/8" TK-10)	**D** (7/8" TK-10)	**E** (5/8" Dypor 607)	**F** (5/8" BG-1000)	**G** (7/8" BG-1000)	**H** (7/8" BG-1002)
Top layer – Depth	6"	12"	6"	6"	6"	6"	6"	6"
Shape	Sphere	Sphere	Disc with 7 cylindrical openings	Disc with 7 cylindrical openings	Disc with one cylindrical opening and six flutes	Disc with four elliptical and one central circular openings	Disc with four elliptical and one central cylindrical openings	Elongated Disc with four elliptical and one central cylindrical openings
Void space	n/a	n/a	55%	55%	60%	60%	60%	63%
Bottom layer – Depth	6"	-	6"	6"	6"	6"	6"	6"
Size and Shape	¾" Sphere	-	¾" Sphere	¾" Sphere	¾" Sphere	¾" Sphere	¾" Sphere	¾" Sphere
Void space	~39 %	-	~39 %	~39 %	~39 %	~39 %	~39 %	~39 %
1. Total number of active cells	36	46	58	46	59	86	69	84
2. % of active cells	14.23%	18.18%	22.92%	18.18%	23.32%	33.99%	27.27%	33.20%
3. Area of Active Cells	49	100	143	72	120	180	121	153
4. Number of active cells greater than 5 cells distance from center	0	0	2	0	1	4	2	10
5. Number of active cells greater than 6 cells distance from center	0	0	0	0	0	0	0	3
6. Average Flow Rate per Active Cell	2.78%	2.17%	1.72%	2.17%	1.69%	1.16%	1.45%	1.19%
7. Maximum Flow Rate in a Cell	10.42%	7.03%	8.45%	10.39%	9.07%	4.46%	7.17%	9.74%
8. Percentage of active cells greater than 3% of total flow	27.78%	23.91%	17.24%	26.09%	23.73%	10.47%	8.70%	8.33%
9. Percentage of active cells greater than 5% of total flow	25.00%	8.70%	5.17%	6.52%	5.08%	0.00%	7.25%	3.57%
10. Lateral Displacement (0 – 100)	38.88	55.55	66.89	NA	NA	72.21	NA	NA
11. Volumetric Distribution (0 – 100)	71.04	69.04	71.83	NA	NA	79.00	NA	NA

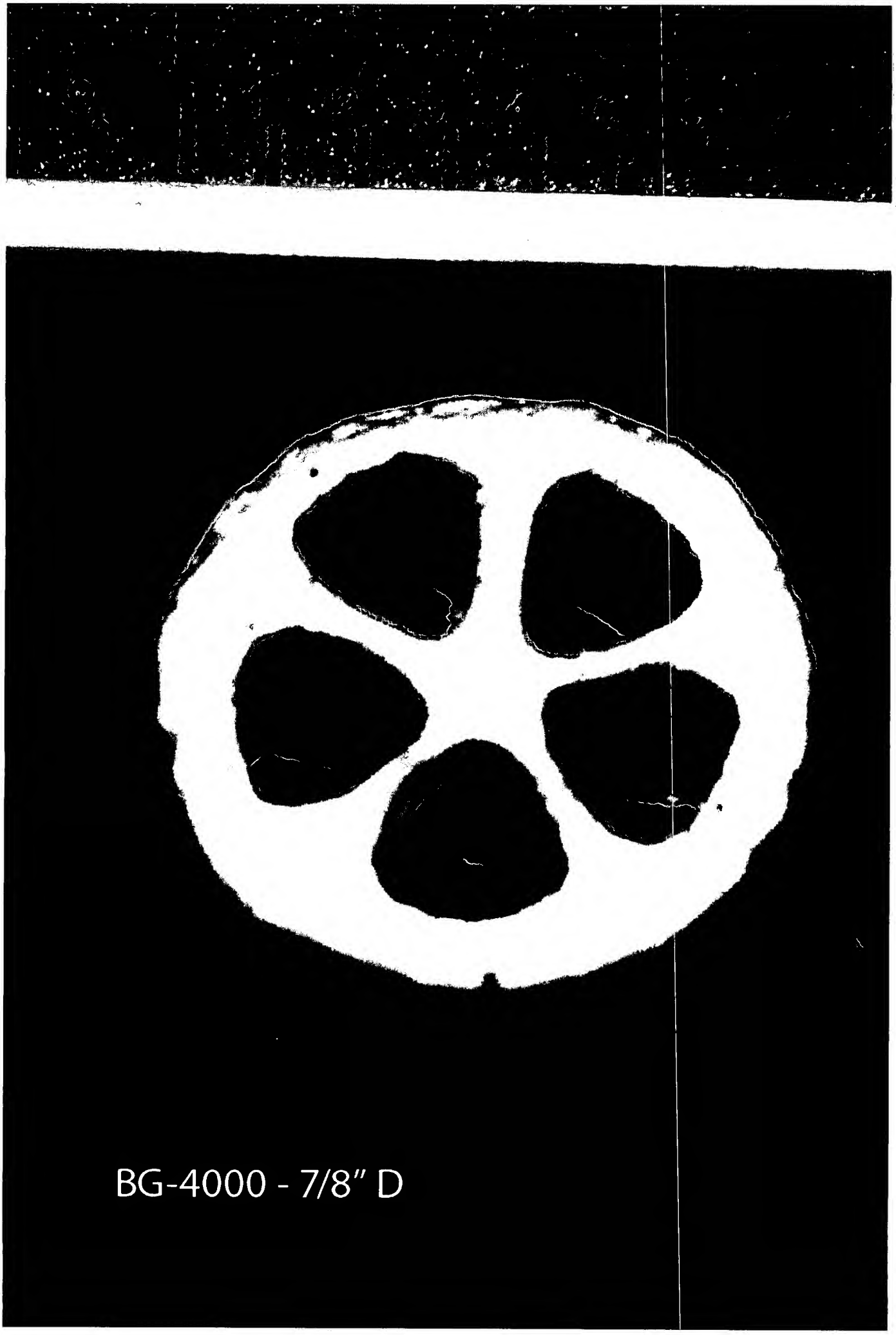
TABLE 2 - SUMMARY OF ADDITIONAL COLD FLOW EXPERIMENT RESULTS				
Shape	PRIOR ART			PRESENT INVENTION
	Triangle Openings	Triangle Openings	Circular, Oval and Triangle Openings	Trisoid Openings
Product	**A** (1-3/4" AFS)	**B** (7/8" Pentaring)	**C** (3/4" BT-750)	**D** (7/8" BG-4000)
Top layer – Depth				
Shape	Disc with 265 triangle openings	Disc with five triangle openings	Disc with 1 central circular opening, four oval openings and four triangle openings	Disc with five trisoid openings
Void space	~75%	~60%	~55%	~60%
Bottom layer – Depth	0"	0"	0"	0"
Size and Shape				
Void space				
1. Total number of active cells	40	67	44	52
2. % of active cells	15.81%	26.48%	17.39%	20.55%
3. Area of Active Cells	132	143	100	144
4. Number of active cells greater than 5 cells distance from center	8	2	5	4
5. Number of active cells greater than 6 cells distance from center	3	0	0	1
6. Average Flow Rate per Active Cell	1.97%	1.41%	2.27%	1.92%
7. Maximum Flow Rate in a Cell	15.00%	11.19%	14.17%	6.40%
8. Percentage of active cells greater than 3% of total flow	2.77%	2.77%	3.56%	3.95%
9. Percentage of active cells greater than 5% of total flow	1.58%	1.58%	1.19%	0.79%
10. Lateral Displacement (0 – 100)	63.94	66.89	55.55	66.66
11. Volumetric Distribution (0 – 100)	50.32	63.87	75.00	85.56


BT-750 - 3/4" D


AFS - 1-3/4" D



Pentaring - 7/8" D



BG-4000 - 7/8" D